R E M A R K S

Applicant has carefully considered the Office Action of September 11, 2007 rejecting all of the claims. The present response is intended to fully address all points of objection raised by the Examiner, and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

A petition for an extension of response time is attached.

The specification has been amended to provide clarification of the inventive process.

Claims 1-2,4-5,7,10,26-27,31,35-36 are currently amended; claims 6,8-9,11-25,28-30,32-34 have been deleted; claims 37-53 are new; claim 3 is the original. Therefore, claims 1-7, 10, 26-27, 31, 35-53 remain in the case.

Claims 1, 27, and 36 and relevant dependent claims have been amended to more clearly define the high-level nature of the characterization process performed by the 3D laser imaging system of the Applicant's invention. The claims also now emphasize that the input and output information from the system of the invention are communicated verbally to the visually impaired or blind person.

REPLY TO EXAMINER

General Remarks

The Applicant's invention tackles the most demanding issue confronting the blind and the visually impaired: that is the decision to take the first safe step along a safe path around the obstacles in a known or unknown environment. Therefore the immediate surroundings facing such people, from 0.5 up to 7-8 meters and what is happening within this close, surrounding range, is of utmost concern to them. The Applicant's invention presents innovative means to detect, analyze and identify objects by names in a highly complex scene where accurate coordinates of all objects, moving or static, are measured, such as size of the obstacles and objects, accurate distance, and accurate bearing or direction from recognized objects to the visually impaired or blind person.

The innovative approach in the Applicant's invention is based on four pillars. The first pillar is the use of a compact, unique, and innovative short range 3-dimensional laser imaging system capable of emitting laser pulses from only one source which scans the space and pierces it tens of thousands of pulses per second. These laser pulses are reflected from surfaces of objects present in close range to a visually impaired and/or blind person using the system of the present invention. This results in a "cloud" of Voxels (spatial pixels) which represents points on all the surfaces which can be observed from the user's point of view.

The second pillar is the application of a set of low-level algorithms on the above-mentioned cloud to decompose the voxels into a set of regular surfaces

defined by Type, Dimensions, Orientation in space, and relative(to the user) Velocity vector.

The third pillar is the application of powerful 3-D, high-level algorithms to act on the regular surfaces to combine these surfaces into 3-D objects identified and assigned names and stored in a hierarchy using a uniquely structured World Model, which hierarchically represents the existing knowledge base of our physical surroundings: known classes of objects; the common relations among them; the relations of objects to their various components; and the way low-level components in the hierarchy can be composed of regular surfaces. This, and the fact that the World Model can grow by "learning" new facts about the physical surrounding, is at the core of the present invention and fully described and claimed as a novel method in the Application.

The fourth pillar is the interpretation of the 3-D scene to a visually impaired or blind person utilizing normal speech communication (synthesized speech), naming objects in the user's "field of view", their distance, azimuth, and direction of movement,without imposing any mental strain on the user as is the case in the prior art inventions where tones in different amplitudes and frequencies are proposed for the communicated characterization of features. The Applicant's invention communicates with a user using speech recognition state-of-the-art techniques in order to enable the user to conveniently and easily operate the device by speech.

The Applicant's invention presents a new paradigm unparalleled in the prior art addressing solely the plight of blind or visually impaired people and the possibility of their integration and normal functioning within society as independent, self-reliant individuals, free to walk about or roam without fear of possible injury or danger

from unfamiliar surroundings or from potentially unseen obstacles. The present invention provides the required and essential capabilities aimed at achieving accurate 3-D representation of the surroundings, no matter how complex the scene, or how many objects are populating the area. Moreover, in a scene description, which is communicated as in a normal speech conversation to the user, priority criteria are adopted and only relevant and important information is communicated verbally to a visually impaired and/or blind user. This is far different than the use of a variation of tones as suggested in the prior art--a method which imposes a needless mental burden on the visually handicapped.

Patents cited by the Examiner from the prior art, discussed below, touch on some areas related to blind and visually impaired people, however the patents cited suffer from major drawbacks and none offers a sound solution solely dedicated to blind and visually impaired people. The new paradigm as presented in the Applicant's invention shows a marked divergence from the prior art as suggested by the cited patents which offer only partial solutions and some crude tools for the assistance of the blind or visually impaired, but these solutions fall short from providing effective measures for helping the visually impaired or blind user in understanding accurately what is happening in his immediate surroundings.

The Applicant's invention solves this problem and provides him with accurate 3-D representation of all objects, moving or stationary, within this surrounding environment. Each object should be defined accurately in terms of size, location and it's bearing to the user and should be communicated to the user verbally, as in normal speech and not simply in mentally challenging audible tones. Without this accurate information the visually

impaired and/or blind user is endangered since inaccurate and crude information will not assist him, nor encourage him to take the first safe step along a safe path as a fully-functioning human being.

It is noted that several claims were rejected on the grounds of similarity in names given to certain blocks within system diagrams such as "Signal Processing Unit" or "Processor Unit" without bothering to understand the substance and the nature of the processing taking place.

The Examiner in several instances reached erroneous conclusions, as if the concept of the World Model as described in the Application of the Applicant is also the core idea in the prior art patents cited, although no reference is given to substantiate this conclusion and the World Model concept is a new one as described in detail in the Application.

The same approach applies to other commonly used technical terms such as "recognition system", "obstacles avoidance", "knowledge database", "range and feature extraction," and "image understanding" which are used in the literature in different contexts each specific to the discussed embodiment and use of the same term in another context does not mean having equivalency or employing the same process. These technical terms are context specific and otherwise too vague for comparison purposes without elaboration and more detailed analysis.

Detailed Remarks

Depta

The Examiner has rejected claims 1-5, 10-12, 14, 22, 27,29-33,and 36 under 35 USC Sec. 102(e) as being anticipated by Depta (US 6,549,122).

In reference to the General Remarks above, the Examiner's reference to "convex polygons" as used in Depta is a specific example of a misunderstanding. It is as if visual images analysis as mentioned in Depta made use of the same analysis as in the Applicant's invention and this is incorrect.

Normally, most patent applications need to resort to system block diagrams to facilitate understanding of the innovative nature of the respective inventions and most drawings refer to the same broad names used for system components, such as sensors, processing units, image processing, signal processing, etc., however each block used in these drawings, although perhaps carrying the same name, generally indicates and describes a different concept of processing which is unique to a particular described invention. This is exactly the case in the diagrams used by the Applicant which refer to a higher level of visualization and differ in concept from those in Depta.

Depta's image processing module 13, for example, is a pattern recognition type, not like that of the 3-D image processor of the Applicant's invention which involves more complex, high-level processes such as decomposition of objects, characterizing scene descriptions, and object synthesis, with no need to store images as in Depta.

In Depta there exists major deficiencies which preclude sensible use of his invention for the benefit of the vision impaired and/or blind user. The use of two

video cameras to estimate or measure accurate range and direction to objects within the immediate vicinity to the user, up to 8-10m, is not feasible unless a large base line (distance between the two cameras) can be established. This is not the case with Depta since the two video sensors are located very close together on the spectacles. Available state-of-the-art literature on algorithms for range estimation based on two video cameras are adequate for long range, beyond 12m, but they collapse in near close range and fail in mapping the immediate vicinity, which is in the range of up to 7-8m, due to the small baseline. Also 3-D rendering of objects to aid in visualization of the real 3-D world fails for the same reason.

Depta makes use of formidable arrays of filters with color polarization and infrared sensors placed in front of the lenses of the video cameras to visualize 3-D and aided by measuring the slight differences between the detected images of the two video cameras, whereas the Applicant's invention uses only one compact 3-D laser imaging device based on nano-technology which is both more effective and efficient.

The Examiner rejects claims 16, 17, 18 and 19 based on Depta by merely calling attention to Fig 2, with no further citation or elaboration from a description in the Depta text to support this action. The Examiner may have inferred that similarity in naming a certain function in the diagram shows equivalency or also means similarity of the process. Such an assumption can impede accepting more advanced approaches which are an improvement over the prior art, as is the case of the Applicant's invention. The Applicant's invention proposes a radical departure from the prior art and the terms or blocks carrying titles, such as "knowledge base", "knowledge editor",

"learning sub-system" as used in Depta are different processes from what is described in the Applicant's invention.

Claims 20, 21 and 22 are rejected by the Examiner although what is communicated to the blind user in Depta is an ensemble of tones and not, as in the Applicant's invention, a verbal description of the objects and the scene in the immediate surroundings of a user in easily comprehended spoken language. This latter definitely points to the fact that the Applicant's invention uses highly advanced processing and identification algorithms that are significant and novel improvements over the prior art, especially, Depta's use of a mentally challenging tonal identification system. The same misunderstanding applies to rejection of other claims due to the similarity in name only of the processes, and failing to address the real nature of the specific process and its implications as explained in the detailed description of the present invention.

The Depta technique of using two video cameras, as described above, would not be suitable for the solution to the problem, therefore linking Depta to the prior art of the Hunter patent adds nothing to the teaching of Depta which would render the present invention obvious.

As stated in the decision in In Re Marshall, 198 USPQ 344 (1978), "To constitute an anticipation, all material elements recited in a claim must be found in one unit of prior art…". Since the Depta reference neither 1) identically describes the invention, nor 2) enables one skilled in the art to practice it, Applicant deems the 102 rejection improper, and respectfully requests that it be withdrawn. Therefore, independent claims 1, 10 and 36 are not anticipated under Sec. 102.

Hunter

The Examiner has rejected claims 1, 5-10, 27, and 36 under 35 USC 102(e) as being anticipated by Arthur Hunter (US 2003/0026461).

The Hunter patent describes a system for aiding a visually handicapped person, but by using stored images and pattern recognition. The Applicant's invention is not the same, using as it does 3-D laser imaging for decompostion/object synthesis with no need for storing images. The concept of the World Model is not taught at all in Hunter.

To begin with, note that all the claims cited against the Applicant in light of Hunter have been amended. Reference is made to Figs. 1 and 2 in Hunter, but the text is more detailed and precise. It is clear that the inventions are not based on the same principles.

Regarding the Hunter patent, the major tool employed is, in fact, a classification process (Optical Character Recognition) of predetermined features which were stored in advance in the device. A unique tone is associated with each identified feature to be communicated to the blind person by different tones indicating different features. There are several drawbacks which lead to inadequacy in use for a visually impaired and/or blind user of the Hunter system and device.

A high-speed classification process to identify a specific feature in a densely populated near field scene confronting such a user, requires a prior recording of the feature, for example, a specific person or a prototype of a man, and views from different aspects or angles. Even so, a partial obstruction of the feature will render the classification process as useless. Pattern recognition algorithms suffer in outdoor use in an uncontrolled environment. Outdoor feature identification has a limited

use and probably can be more effective when used in a controlled environment such as with ATMs to identify a specific individual and matching his distinct facial features with corresponding features already stored in the system.

The Applicant's invention, on the other hand, is not concerned with facial recognition which is a low-level of image processing. This type of authentication is left to ATM`s and other transaction machines where a user requires validation or authenticity of his identity.

Moreover, association of each feature with a specific audible tone could impose an unbearable mental burden on the handicapped person using the system. Furthermore, Hunter's patent is not necessarily intended for blind or visually impaired people as asserted in (0100 line 2). Finally, use of GPS (Global Positioning System) refers to other prior art approaches under the title of "talking map" where objects in a known environment can be mapped and retrieved from memory when matching in location is achieved. Use of tags refers to a cooperative approach unacceptable for use in an unknown or unfamiliar environment, unless, for example, a local municipality attaches tags to all objects in the streets, whether stationary or moving objects; hardly a likely prospect.

Sussman

Claims 10, 13, 17, 34, and 35 are rejected by the Examiner under 35 USC 102(e)as being anticipated by Sussman (US 6,198,395).

Sussman`s invention presents a partial solution for the benefit of a visually impaired or blind person, but it suffers from serious drawbacks. In the Applicant's invention there is provided a single laser source which scans the space confronting the blind, and pierces the

space with tens of thousands of laser pulses per second. The reflected pulses (volume pixels) are detected by a single laser detector synchronized to the laser emitter. In Sussman, the 3D rendering of the surroundings suffers from low resolution due to the limited number of laser emitters that can be assembled on the lasers array. Whereas in the Applicant's invention, a high-resolution 3D rendering is possible and deemed a must in order to determine and identify objects by their names, and communicate object names to the blind by everyday speech utterances. Another drawback in Sussman's invention is the type of communication employed to communicate with the visually impaired. This is done by tones or vibrations which impose a mental burden on the user who needs to memorize different tones and associated meanings. In Sussman, only a crude indication of direction to objects can be provided and the array of lasers is split to indicate right or left.

Sussman describes an "array" of lasers covering the eyes of a user in a band (2:line 48).The device can "detect" and identify "distances to objects" using "audible signals" in feedback to a user, or, alternatively, by "vibrators" or "tactile signals" (4, line 14). The device requires "training and experience" (6, line 20).

The Examiner cites claims 10 and 35 as anticipated by Sussman. Both these claims have been slightly amended, but there is no lack of reasons to traverse the Examiner's opinion regarding superficial similarities.The Applicant's apparatus requires only one 3-D laser imaging device rather than the band of laser imaging or ultrasonic sensors which Sussman teaches. The 3-D laser imaging device is less cumbersome and more aesthetic than the band

that encircles the head of a user with an array of either lasers or ultrasonic sensors as in Sussman's device.

Use of 3-D laser imaging is a vast improvement and a far superior method for representing a scene and objects to a visually impaired user when used in combination with a World Model as in the Applicant's invention. Furthermore, the computerized interpretation means provided by the World Model for identifying and naming objects and elements of a scene and describing them in conversational speech to a user, is more user-friendly and does not take any time at all to learn to use, as opposed to the training time required to learn the tonal system and their meanings in Sussman's patent.

Sussman may teach using "audible" signals, but these are not speech, but rather tones. Alternatively, Sussman suggests communication using vibrations or tactile sensations which are irrelevant to the Applicant's invention.

Basson and Depta

Claims 23-26, and 28 are rejected under 35 USC 103(a) as being unpatentable over Depta (US 6,549,122) in view of Basson et al. (US 6,975,991).

Basson is associated with Depta on the basis of Sec. 103(a) for obviousness in light of their common points of reference to the Applicant's invention. Claims 23-25 and 28 have been deleted. Claim 26 has been amended.

Basson's invention tackles other aspects of video and signal processing algorithms which are orthogonal and different from those required to aid blind people. Basson is concerned with providing a solution for **hearing impaired persons** to allow them to identify a speaker in a rather controlled environment, such as meeting room or in

a convention hall. A speaker can be identified by analyzing his facial changes, typical to a speaking person, and this way, one can decide whether he is the speaker, or if not, move to another person, and so on. The Applicant's invention, on the other hand, is not concerned with identifying facial changes and facial analysis is not required. Moreover, Basson is not concerned with providing accurate range and direction to a specific man or speaker, hence Basson uses two video cameras to roughly indicate the location of the speaker. The fact that a hearing impaired person can see and notice visual indicators on the special eyeglasses in a preferred embodiment of the Basson invention is a major aid to the hearing challenged user which is denied to a blind person.

Note that Basson refers to output of recognizable speech which is converted to visual displays, whereas the Applicant's invention describes verbal input to the Processing and Control unit for instructing the system in a "learning" type discourse. The major focus of the Basson patent in any case is on hearing impaired users who need to hear presentations. He suggests that the voice of a stenographer or transcriber be converted into text or visual displays on eyeglasses. This is not the same problem and therefore, not the same solution as that addressed by the Applicant's invention which focuses on a visually impaired user.

In contrast to Basson and other prior art patents, the present invention discloses a method of 3-D imaging and interpretation to achieve a high-level of recognition and interpretation of real objects within the field of vision of a visually impaired user and verbal communication in ordinary speech between the system and the user both for input and for output of information.

It is the Applicant's position that the combination of the Depta and Basson references to form the basis of the Sec. 103 rejection is improper, and Applicant respectfully requests that it be withdrawn.

Therefore, claims 1, 10, 27 are deemed to be patentable, and dependent claims are deemed to be patentable as being based thereon.

In citing the references under Sec. 103(a), the question is raised whether the references would suggest the invention, as stated in the decision Re Lintner (172 USPQ 560, 562, CCPA 1972);

> "In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the references before him to make the proposed substitution, combination or other modification."

Similarly, in Re Regel (188 USPQ 136, CCPA 1975) decided that the question raised under Sec. 103 is whether the prior art taken as a whole would suggest the claimed invention to one of ordinary skill in the art. Accordingly, even if all the elements of a claim are disclosed in various prior art references, the claimed invention taken as a whole cannot be said to be obvious without some reason given in the prior art why one of ordinary skill would have been prompted to combine the teachings of the references to arrive at the claimed invention.

Simply put, and as stated in Re Clinton (188 USPQ 365 CCPA 1976), "do the references themselves...suggest doing what appellants have done", such that there is a requirement that the prior art must have made any proposed modification or changes in the prior art obvious to do, rather than obvious to try.

It is respectfully put forward by the Applicant that there is no reason to consider the prior art references, Depta, Basson, Hunter, and Sussman, either individually or in combination, as rendering the invention obvious, since none of them discloses a 3-D laser imaging system used for decomposition/object synthesis with no need for storing images.

The World Model concept of the Applicant also is an advance over the prior art in that it requires application of sophisticated algorithms and high-level computations to characterize the complex physical environment challenging the visually impaired and blind and for accurate 3-D rendering. The system of the Applicant's invention uses the World Model to aid the user in real-time to identify at least one object in his "field of view", not just to safely navigate around it or simply avoid obstacles, but to name objects and identify scenes, thus adding newly learned information about unknown objects and experiences to the World Model. This "learning ability" is continuously exercised and used to improve the system of the present invention so that it is a faithful and dependable guide to independent movement in the physical world for the visually handicapped and the blind.

In view of the foregoing remarks, all of the claims in the application are deemed to be allowable. Further reconsideration and allowance of the application is respectfully requested at an early date.

Respectfully submitted,

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